CLAIMS

WHAT IS CLAIMED:

1. A method, comprising:

forming a metal seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

deactivating at least a portion of said metal seed layer in areas where said metal seed layer is positioned above at least some of said field areas; and

performing a deposition process to deposit a metal layer above said metal seed layer.

2. The method of claim 1, wherein forming said metal seed layer comprises performing at least one of a physical vapor deposition process and a chemical vapor deposition process to form said metal seed layer.

3. The method of claim 1, wherein forming said metal seed layer comprises forming said metal seed layer to a thickness that ranges from approximately 50-250 nm.

4. The method of claim 1, wherein deactivating at least a portion of said metal seed layer comprises implanting ions into said areas of said metal seed layer.

5. The method of claim 4, wherein implanting ions into said areas of said metal seed layer comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into said areas of said metal seed layer.

6. The method of claim 4, wherein implanting ions into said areas of said metal seed layer comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into said areas of said metal seed layer.

7. The method of claim 4, wherein implanting ions into said areas of said metal seed layer comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into said areas of said metal seed layer.

8. The method of claim 1, wherein performing a deposition process to deposit said metal layer above said metal seed layer comprises performing an electroplating process to deposit said metal layer above said metal seed layer.

9. The method of claim 8, wherein performing an electroplating process to deposit metal above said metal seed layer comprises positioning said metal seed layer in an electroplating bath and passing a current through said metal seed layer.

10. The method of claim 1, wherein performing a deposition process to deposit said metal layer above said metal seed layer comprises performing an electroless process to deposit said metal layer above said metal seed layer.

11. The method of claim 10, wherein performing an electroless process to deposit said metal layer above said metal seed layer comprises positioning said metal seed layer in a electrolytic solution without applying an external voltage to said metal seed layer.

12. The method of claim 1, further comprising performing a chemical mechanical polishing process to remove at least said metal seed layer from above said field areas.

13. The method of claim 1, wherein said metal seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

14. The method of claim 4, wherein implanting ions into said metal seed layer comprises implanting said ions into said metal seed layer to form an implant region in said metal seed layer comprised of said implanted ions.

15. The method of claim 14, wherein implanting ions into said metal seed layer comprises implanting said ions into said metal seed layer to form an implant region in said metal seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm.

16. The method of claim 1, wherein said metal seed layer is comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

17. The method of claim 1, wherein said metal layer deposited above said metal seed layer is comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

18. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

deactivating at least a portion of said copper seed layer in areas where said copper seed layer is positioned above at least some of said field areas; and

performing an electroplating process to deposit copper above said copper seed layer.

19. The method of claim 18, wherein forming said copper seed layer comprises performing a physical vapor deposition process to form said copper seed layer.

20. The method of claim 18, wherein forming said copper seed layer comprises forming said copper seed layer to a thickness that ranges from approximately 50-250 nm.

21. The method of claim 18, wherein deactivating areas of said copper seed layer comprises implanting ions into said areas of said copper seed layer.

22. The method of claim 21, wherein implanting ions into said areas of said copper seed layer comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into said areas of said copper seed layer.

23. The method of claim 21, wherein implanting ions into said areas of said copper seed comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into said areas of said copper seed layer.

24. The method of claim 21, wherein implanting ions into said areas of said copper seed layer comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into said areas of said copper seed layer.

25. The method of claim 18, wherein performing an electroplating process to deposit copper above said copper seed layer comprises positioning said copper seed layer in an electroplating bath and passing a current through said copper seed layer.

26. The method of claim 18, further comprising performing a chemical mechanical polishing process to remove at least said copper seed layer from above said field areas.

27. The method of claim 18, wherein said copper seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

28. The method of claim 21, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprises of said implanted ions.

29. The method of claim 28, wherein said copper seed layer has a deposited thickness and wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm.

30. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

deactivating at least a portion of said copper seed layer in areas where said copper seed layer is positioned above at least some of said field areas; and

performing an electroless process to deposit copper above said copper seed layer.

31. The method of claim 30, wherein forming said copper seed layer comprises performing a physical vapor deposition process to form said copper seed layer.

32. The method of claim 30, wherein forming said copper seed layer comprises forming said copper seed layer to a thickness that ranges from approximately 50-250 nm.

33. The method of claim 30, wherein deactivating areas of said copper seed layer comprises implanting ions into said areas of said copper seed layer.

34. The method of claim 33, wherein implanting ions into said areas of said copper seed layer comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into said areas of said copper seed layer.

35. The method of claim 33, wherein implanting ions into said areas of said copper seed comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into said areas of said copper seed layer.

36. The method of claim 33, wherein implanting ions into said areas of said copper seed layer comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into said areas of said copper seed layer.

37. The method of claim 30, wherein performing an electroless process to deposit copper above said copper seed layer comprises positioning said copper seed layer in an electrolytic solution without applying an external voltage to said copper seed layer.

38. The method of claim 30, further comprising performing a chemical mechanical polishing process to remove at least said copper seed layer from above said field areas.

39. The method of claim 30, wherein said copper seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

40. The method of claim 33, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprises of said implanted ions.

41. The method of claim 40, wherein said copper seed layer has a deposited thickness and wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm.

42. A method, comprising:

forming a metal seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

implanting ions into areas of said metal seed layer positioned above at least some of said field areas; and

performing a deposition process to deposit a metal layer above said metal seed layer.

43. The method of claim 42, wherein forming said metal seed layer comprises performing at least one of a physical vapor deposition process and a chemical vapor deposition process to form said metal seed layer.

44. The method of claim 42, wherein forming said metal seed layer comprises forming said metal seed layer to a thickness that ranges from approximately 50-250 nm.

45. The method of claim 42, wherein implanting ions into areas of said metal seed layer positioned above at least some of said field areas comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into areas of said metal seed layer positioned above at least some of said field areas.

46. The method of claim 42, wherein implanting ions into areas of said metal seed layer positioned above at least some of said field areas comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into areas of said metal seed layer positioned above at least some of said field areas.

47. The method of claim 42, wherein implanting ions into areas of said metal seed layer positioned above at least some of said field areas comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into areas of said metal seed layer positioned above at least some of said field areas.

48. The method of claim 42, wherein implanting ions into areas of said metal seed layer positioned above at least some of said field areas comprises implanting ions into areas of said metal seed layer positioned above at least some of said field areas to cause deactivation of at least a top surface of said metal seed layer positioned above at least some of said field areas.

49. The method of claim 42, wherein performing said deposition process to deposit said metal layer above said metal seed layer comprises performing an electroplating process to deposit said metal layer above said metal seed layer.

50. The method of claim 42, wherein performing said electroplating process to deposit said metal layer above said metal seed layer comprises positioning said metal seed layer in an electroplating bath and passing a current through said metal seed layer.

51. The method of claim 42, wherein performing a deposition process to deposit said metal layer above said metal seed layer comprises performing an electroless process to deposit said metal layer above said metal seed layer.

52. The method of claim 51, wherein performing an electroless process to deposit said metal layer above said metal seed layer comprises positioning said metal seed layer in a electrolytic solution without applying an external voltage to said metal seed layer.

53. The method of claim 42, further comprising performing a chemical mechanical polishing process to remove at least said metal seed layer from above said field areas.

54. The method of claim 42, wherein said metal seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

55. The method of claim 42, wherein implanting ions into areas of said metal seed layer comprises implanting said ions into areas of said metal seed layer to form an implant region in said areas of said metal seed layer comprised of said implanted ions.

56. The method of claim 42, wherein implanting ions into areas of said metal seed layer comprises implanting said ions into said metal seed layer to form an implant region in said metal seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm.

57. The method of claim 42, wherein said metal seed layer is comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

58. The method of claim 42, wherein said metal layer deposited above said metal seed layer is comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

59. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas; and

performing an electroplating process to deposit copper above said copper seed layer.

60. The method of claim 59, wherein forming said copper seed layer comprises performing a physical vapor deposition process to form said copper seed layer.

61. The method of claim 59, wherein forming said copper seed layer comprises forming said copper seed layer to a thickness that ranges from approximately 50-250 nm.

62. The method of claim 59, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into areas of said copper seed layer positioned above at least some of said field areas.

63. The method of claim 59, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into areas of said copper seed layer positioned above at least some of said field areas.

64. The method of claim 59, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into areas of said copper seed layer positioned above at least some of said field areas.

65. The method of claim 59, wherein performing an electroplating process to deposit copper above said copper seed layer comprises positioning said copper seed layer in an electroplating bath and passing a current through said copper seed layer.

66. The method of claim 59, further comprising performing a chemical mechanical polishing process to remove at least said copper seed layer from above said field areas.

67. The method of claim 59, wherein said copper seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

68. The method of claim 59, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprises of said implanted ions.

69. The method of claim 59, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm

70. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas to thereby form implant regions in said copper seed layer positioned above said field areas; and

performing an electroplating process to deposit copper above said copper seed layer.

71. The method of claim 70, wherein forming said copper seed layer comprises performing a physical vapor deposition process to form said copper seed layer.

72. The method of claim 70, wherein forming said copper seed layer comprises forming said copper seed layer to a thickness that ranges from approximately 50-250 nm.

73. The method of claim 70, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into areas of said copper seed layer positioned above at least some of said field areas.

74. The method of claim 70, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into areas of said copper seed layer positioned above at least some of said field areas.

75. The method of claim 70, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into areas of said copper seed layer positioned above at least some of said field areas.

76. The method of claim 70, wherein performing an electroplating process to deposit copper above said copper seed layer comprises positioning said copper seed layer in an electroplating bath and passing a current through said copper seed layer.

77. The method of claim 70, further comprising performing a chemical mechanical polishing process to remove at least said copper seed layer from above said field areas.

78. The method of claim 70, wherein said copper seed layer is formed above a previously formed barrier metal layer formed above said patterned layer of insulating material.

79. The method of claim 70, wherein implant regions in said copper seed layer have a depth that ranges from approximately 5-50 nm.

80. A method, comprising:

forming a barrier metal layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

depositing a copper seed layer above said barrier metal layer;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas, said implant ions being selected from the group consisting of nitrogen, carbon, silicon and hydrogen; and

performing an electroplating process to deposit copper above said copper seed layer.

81. The method of claim 80, wherein depositing said copper seed layer comprises performing a physical vapor deposition process to deposit said copper seed layer.

82. The method of claim 80, wherein depositing said copper seed layer comprises depositing said copper seed layer to a thickness that ranges from approximately 50-250 nm.

83. The method of claim 80, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at a dopant dose of approximately $1e^{13}$-$1e^{21}$ ions/cm^2 into areas of said copper seed layer positioned above at least some of said field areas.

84. The method of claim 80, wherein implanting ions into areas of said copper seed layer positioned above at least some of said field areas comprises implanting ions at an implant energy level that ranges from approximately 1-200 keV into areas of said copper seed layer positioned above at least some of said field areas.

85. The method of claim 80, wherein performing an electroplating process to deposit copper above said copper seed layer comprises positioning said copper seed layer in an electroplating bath and passing a current through said copper seed layer.

86. The method of claim 80, further comprising performing a chemical mechanical polishing process to remove at least said copper seed layer from above said field areas.

87. The method of claim 80, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprises of said implanted ions.

88. The method of claim 80, wherein implanting ions into said copper seed layer comprises implanting said ions into said cooper seed layer to form an implant region in said copper seed layer comprised of said implanted ions, said implant region having a depth that ranges from approximately 5-50 nm.

89. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas; and

performing an electroless process to deposit copper above said copper seed layer.

90. A method, comprising:

forming a copper seed layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas to thereby form implant regions in said copper seed layer positioned above said field areas; and

performing an electroless process to deposit copper above said copper seed layer.

91. A method, comprising:

forming a barrier metal layer above a patterned layer of insulating material, said patterned layer of insulating material defining a plurality of field areas;

depositing a copper seed layer above said barrier metal layer;

implanting ions into areas of said copper seed layer positioned above at least some of said field areas, said implant ions being selected from the group consisting of nitrogen, carbon, silicon and hydrogen; and

performing an electroless process to deposit copper above said copper seed layer.

92. A system, comprising:

a stencil mask implant tool for implanting ions into selected areas of a metal seed layer formed above a patterned layer of insulating material that defines a plurality of field areas, said ions being implanted into areas of said metal seed layer positioned above at least some of said field areas.

93. The system of claim 92, further comprising a chemical mechanical polishing tool for performing a chemical mechanical polishing process to remove at least portions of said metal seed layer.

94. The system of claim 92, further comprising an electroplating bath for depositing a layer of metal above said metal seed layer.

95. The system of claim 92, wherein said stencil mask tool is adapted to implant ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into said metal seed layer.

96. The system of claim 92, wherein said stencil mask tool is adapted to implant ions into selected portions of said metal seed layer, said metal seed layer being comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

97. The system of claim 94, wherein said electroplating bath is adapted to deposit a layer of metal comprised of copper.

98. The system of claim 92, further comprising a deposition tool to deposit a metal layer above said metal seed layer.

99. The system of claim 98, wherein said deposition tool is adapted to deposit a metal layer comprised of at least one of copper, platinum, nickel, tungsten, tantalum, cobalt, silver and gold.

100. The system of claim 92, further comprising an electroless bath for depositing a layer of metal above said metal seed layer by an electroless process.

101. A system, comprising:

a stencil mask implant tool for implanting ions into selected areas of a copper seed layer formed above a patterned layer of insulating material that defines a plurality of field areas, said ions being implanted into areas of said copper seed layer positioned above at least some of said field areas.

102. The system of claim 101, further comprising a chemical mechanical polishing tool for performing a chemical mechanical polishing process to remove at least portions of said copper seed layer.

103. The system of claim 101, further comprising an electroplating bath for depositing a layer of copper above said copper seed layer.

104. The system of claim 101, wherein said stencil mask tool is adapted to implant ions comprised of at least one of nitrogen, carbon, silicon and hydrogen into said copper seed layer.

105. The system of claim 101, further comprising an electroless bath for depositing a layer of metal above said metal seed layer by an electroless process.